



Overview

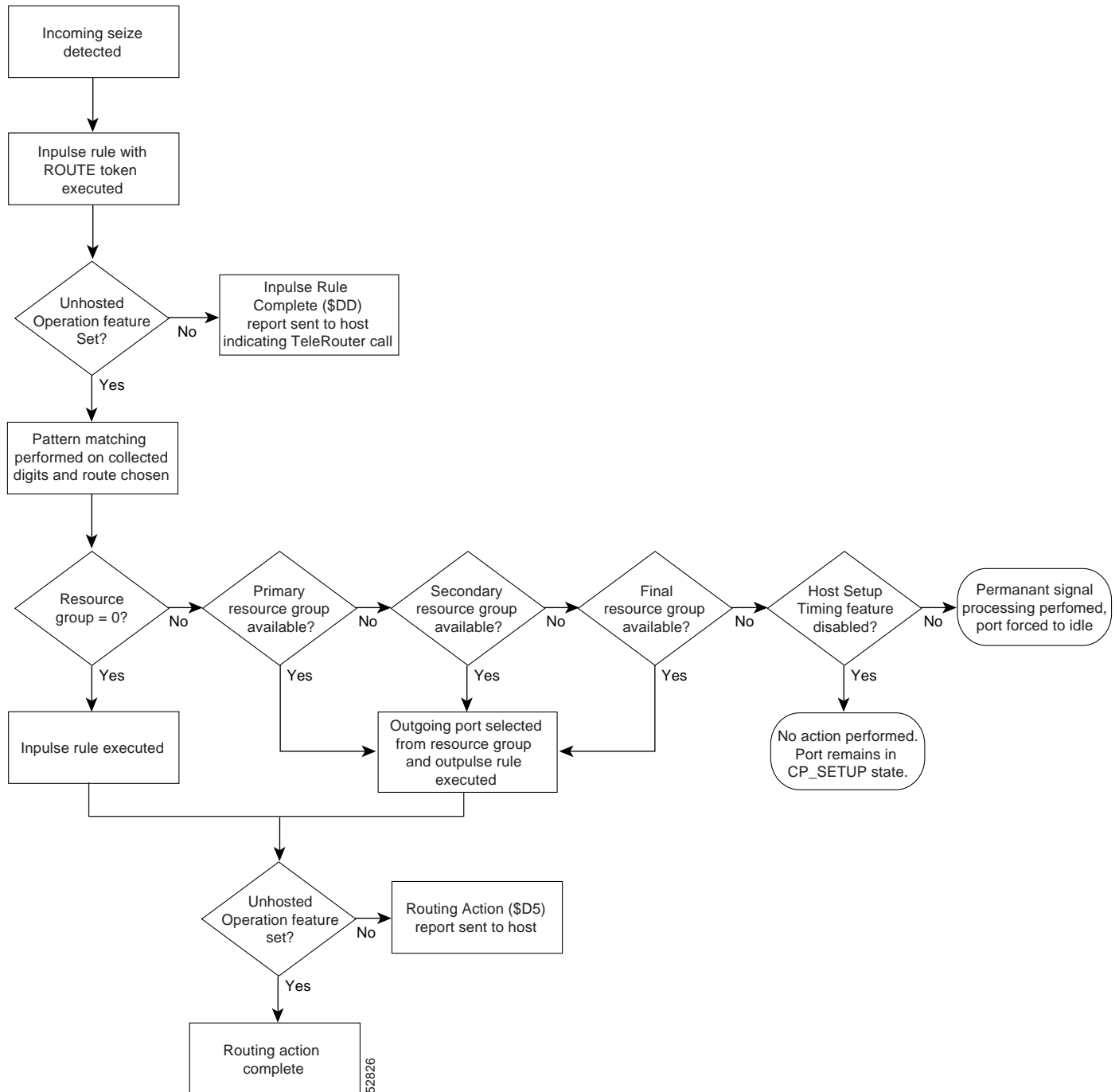
TeleRouter is a software overlay to the VCO/4K system software that allows the system to interpret dialed digit information and execute call routing decisions based on the information. All standard system functions are maintained. Additional TeleRouter capabilities allow you to design switching scenarios completely within the system. TeleRouter can be used in conjunction with a host computer in a normal system hosted environment, or it can independently perform routing actions on the switch in an unhosted configuration.

Screens within standard system administration menus provide access to TeleRouter functions. These screens create routing instruction tables. An additional impulse rule token initiates the instructions included in the routing tables.

Call Routing Flow

The TeleRouter call routing process uses pattern matching of dialed digits to establish switched connections between incoming and outgoing ports on the system. An overview of this process is shown in Figure 1-1.

Figure 1-1 Typical TeleRouter Call Flow



During a typical call routing scenario, dialed digits are collected through impulse rule processing. An IP ANI [xx] or IP FIELD [xx] token collects digits from an incoming port and stores them in the specified field. These digits can be either MF or DTMF digits. In the case of MF digits, the KP and ST start/end designators are stripped when the digit string is stored. The last token in the impulse rule must be a ROUTE [Tx] token.

The ROUTE [Tx] token initiates pattern matching on the digits stored in the “x” digit field. The template information configured for the “T” route table specifies the parameters for pattern matching. Template parameters include the size (the number of consecutive digits used for matching), the starting position (the first digit within the digit string to begin matching), and the minimum number of digits necessary for matching.

The digits stored in field “x” are compared against the patterns established for the individual routes within a route table. Each route table can contain many routes, totaling up to 1000 routes distributed over the ten route tables. In addition to the user-configured route patterns, three exception routes are predefined for incomplete digit collections, empty collections and unmatched patterns. A fourth predefined route exists for direct routing.

Incomplete digit collections, referred to as short collections, are digits strings without the minimum number of digits specified in the route table template. Empty collection routes manage situations when no digits are stored in the specified digit field. When collected digits do not match any of the user-configured patterns, the route designated for unmatched patterns may be used. Nailed-up connections, referred to as direct routing, can be accomplished without pattern matching the collected digits. Setting “x” to zero in the ROUTE [Tx] token performs direct routing.

User-configured patterns can use the wildcard characters Z, N, X and * in addition to standard digits. The wildcard character “Z” matches digits 0 and 1, “N” matches digits 2 through 9, “X” matches digits 0 through 9, and “*” matches any digit, including 0 through 9, * and #. When the digits match a pattern assigned to a specific route, a routing action is performed.

Instructions for the routing action can include executing an impulse rule, or hunting an outgoing port from a resource group and executing an outpulse rule. Resource groups are indicated by number, with a value of 0 indicating that an impulse rule should be performed. A letter “I” and a number identifies the impulse rule. When a resource group is specified, TeleRouter executes the outpulse rule indicated by an “O” and a number. Each resource group and impulse/outpulse rule pair comprises one instruction.

Up to three instructions can be designated for each route: Primary, Secondary and Final. The system will hunt for an available resource from the Primary group. If a resource is available, the Primary outpulse rule is executed. If no resources can be allocated from the Primary group, the system begins hunting from the Secondary resource group. The Secondary outpulse rule is performed if an available resource is found. If not, the system hunts from the Final resource group and executes the Final Rule if the hunt is successful.

Routing actions cannot be performed if no outgoing ports are available from the resource groups designated by the route's instructions. When this occurs, the incoming port is placed into one of two call states. If the Disable Host Setup Timing system feature flag is set to **Y**, the port remains in setup state awaiting host intervention. If the feature is not disabled (the flag is set to **N**), Permanent Signal processing is performed in an attempt to return the port to idle state. A Permanent Signal Condition (\$D2) report will be sent if TeleRouter is running in a hosted environment. Refer to the *Cisco VCO/4K System Administrator's Guide* for more information on system feature settings.

Resource Group Allocation

Resource group allocation plays a vital role in TeleRouter call processing. Ports are assigned to resource groups using the Resource Group Configuration screen standard to system software. (Refer to the *Cisco VCO/4K System Administrator's Guide*.) Resource groups are specified for the Primary, Secondary and Final instructions for hunting using the Routing Table Configuration screen. (Refer to the “Routing Table Configuration Screen” section on page 3-7.)

Instructions are organized in a three-level hierarchy. TeleRouter will first hunt for available resources from the Primary resource group, and then from the Secondary group only if no outgoing ports are available from the Primary group. Similarly, TeleRouter will only hunt from the Final group if no ports are available from the Primary and Secondary resource groups.

When TeleRouter is operating in an unhosted environment, users are informed of resource limitations by two additional TeleRouter minor alarms. The first alarm, Group OOS Limit Exceeded, warns the user that more than 75 percent of the ports in any resource group have been busied out and a resource limitation condition is pending. The second alarm, Resource Limitation Exists, notifies the user that no ports are available in a particular resource group. In the hosted configuration, resource limitations are indicated by Resource Limitation (\$D6) reports, and Logfile status and error messages.

Example of Call Routing

This example traces the process of collecting digits, executing a ROUTE [Tx] token, performing pattern matching, and carrying out routing instructions.

Digits are collected by the system using impulse rule processing. The impulse rule described in Table 1-1 collects seven MF digits from an incoming port and stores them in a digit field 2. For example, assume the digit string 5556003 was collected and stored in digit field 2. The ROUTE [Tx] takes these digits and attempts to route the call using Route Table A.

Table 1-1 Impulse Rule Example

Rule #1	
CONT NREP	
MF	
WINK ENAB	
IP FIELD	2
ROUTE	A2

Route Table A, named Example, contains three routes (see Table 1-2) and specifies the template parameters for pattern matching. According to the template parameters, four digits from the collected digit string (beginning with the fourth digit collected) are matched against the configured patterns. In this example, the digits 6003 are matched against the route patterns (see Table 1-3).

Table 1-2 Route Table Example

Route Table	Number of Routes	Route Table Name	Template		Minimum Digits
			Size	Start	
A	3	Example	4	4	7

The collected digits shown in Table 1-3 match the pattern configured for Route 1. The Primary instruction for Route 1 begins hunting resources from outpulse rule 1. If an available outgoing port is found in this group, outpulse rule 2 is executed. If no ports are available, the Secondary instruction is used. Hunting is performed from outpulse rule 3, and outpulse rule 4 is executed if the hunt is successful. If no ports are available from outpulse rule 3, the Final instruction (hunting from outpulse rule 4 and executing outpulse rule 6) is used. Once an available outgoing port is found, the routing action is complete.

The route configurations shown in Table 1-3 demonstrate additional routing possibilities.

Table 1-3 Route Configuration Example

Route	Pattern	Primary		Secondary		Final	
		Group	Rule	Group	Rule	Group	Rule
1	*** 6003 *****	1	O 2	3	O 4	4	O 6
2	*** 6005 *****	2	O 1	2	O 5	0	I 7
0	*** 6006 *****	0	I 7	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
S	SHORT COLLECTION	0	I 0	0	I 0	0	I 0
E	EMPTY COLLECTION	0	I 0	0	I 0	0	I 0
U	UNMATCHED PATTERN	0	I 2	0	I 0	0	I 0
D	DIRECT ROUTE	0	I 0	0	I 0	0	I 0

If, for example, the collected digits were 5556006, inpulse rule 7 would be executed. No resource hunting would take place. In the case of an unmatchable pattern, such as the digits 5556007, the instructions for Route U (Unmatched Pattern) would be used. The Primary instruction for this case executes inpulse rule 2.

TeleRouter PRI B-Channel Support

When used with the optional ISDN PRI software package, TeleRouter supports call routing to and from ISDN PRI B-channels. This includes calls between B-channels and non-ISDN network interface ports (e.g. SLIC-2, DID-2, E+M, UTC-2 and T1). Routing operates in the same manner as with non-ISDN resources.

Observe the following guidelines when using TeleRouter for ISDN calls:

- An ISDN Message Template must be used to process the Channel ID Information Element (IE). A PROCESS CHAN ID is included in the message template in response to a received SETUP message. The message template is then “called” in the default inpulse rule defined for the B-channels on the PRI card. Refer to the *Cisco VCO/4K ISDN Supplement* for information on ISDN Message Templates and Channel ID IE processing.
- TeleRouter routes calls based on a string of up to 20 digits. Although an ISDN digit field is capable of collecting up to 85 digits, routing is based on the first 20 digits in a field; the twenty-first and subsequent digits are discarded.

- Resource types should not be mixed within a single resource group. Although this is true of all system resource types, it is especially important that ISDN and non-ISDN ports not be assigned to the same resource group due to call processing and other differences.
- Because routing can only be performed if the Channel ID IE is processed by the system, hyperchannel capability (switching of up to 23 contiguous B-channels) is not supported.

TeleRouter Installation Instructions

This section details the procedure for installing the TeleRouter Package. It is assumed the reader has a working knowledge of system operation and the system onto which the option is to be installed is running system software version 4.0 or later. For information on system requirements, refer to the *Cisco VCO/4K System Software Release Notes*.

The TeleRouter diskette contains an installation utility specific to the software being installed. This utility consists of the installation program and a set of disk utilities to allow operations such as database backup during the software installation process. The disk utilities are documented in the *Cisco VCO/4K System Administrator's Guide*.

The system must be off line in order to perform the installation procedure. Estimated time for completion of software installations is 5 minutes (10 minutes for a redundant system) plus additional time to define the routing tables.



Note

Prior to any software installation procedure, make a backup copy of the system database. This safeguards against any errors that may occur during the installation process.

Before proceeding with the installation, make sure you read and understand all the material contained in this section. You should also have the following publications on hand for easy reference:

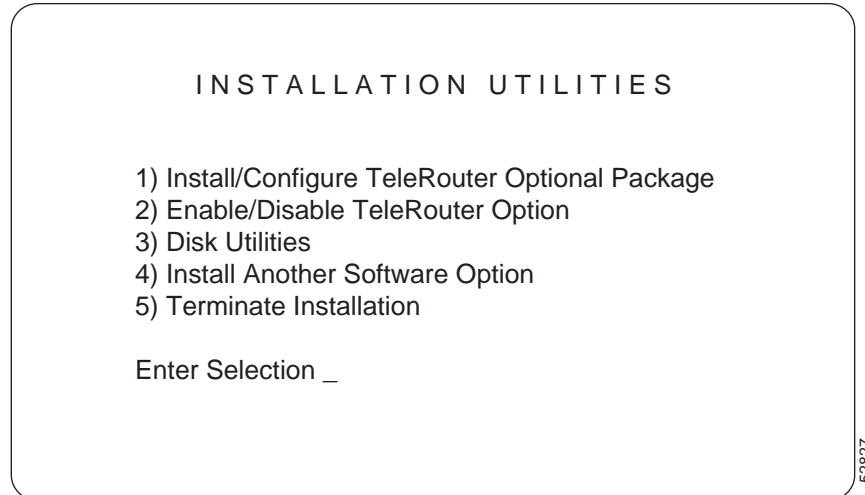
- *Cisco VCO/4K Hardware Installation Guide*
- *Cisco VCO/4K Software Installation Guide*
- *Cisco VCO/4K System Maintenance Manual*
- *Cisco VCO/4K System Administrator's Guide*

TeleRouter Installation

To install the TeleRouter Package, follow these steps:

-
- Step 1** Insert the TeleRouter diskette into the A-side drive.
- Step 2** Power up the system or press the Alarm Arbiter Card (AAC) **RESET** button for the A-side system controller. After the system performs diagnostic tests (indicated by self-test messages), the Installation Utilities Menu is displayed as shown in Figure 1-2. The cursor is located in the Enter Selection data entry field.

Figure 1-2 TeleRouter Installation Utilities Screen



Step 3 Type **1** and press **Return**. The following message appears:

```
Do You Wish To Back-Up The System Data Base? (Y/N) _
```

Backing up the database is optional. Because the hard disk drive is not reformatted as part of this option, no data will be lost.

Step 4 Determine whether to back up the system:

- If you want to perform a database backup, type **Y** and press **Return**. The following message appears and the display returns to the Installation Utilities screen:

```
Software Installation Aborted by Operator
```

Perform a database backup using the Disk Utilities (refer to the “Performing a Database Backup” section on page 1-8) and then restart the installation process.

- If you do not want to perform a database backup, type **N** and press **Return**. The following messages appear and the display returns to the Installation Utilities menu.

```
Copying A:/TELERTE.EXE...
```

```
1 file[s] copied
```

```
TeleRouter Option Enabled
```

Step 5 Determine whether to install other optional software:

- If no other optional software needs to be installed, go to Step 7.
- To install another optional software package, type **4** and press **Return**. The following messages appear:

```
Insert Another Install Disk
```

```
Press Return To Continue
```

Step 6 Remove the current diskette from the drive and insert the diskette containing the software option. When this has been done, press **Return**. Repeat Step 3 and Step 4.

Step 7 Determine the redundancy configuration of your system.

- If the system is nonredundant, go to Step 8.
- If the system is redundant, connect the system console to the B-side system controller and repeat Step 1 through Step 7 for the B side.

- Step 8** When all software has been installed, reconnect the system console to the A-side system controller (if necessary), then set the AAC **SELECT** to **Auto**. At the Installation Utilities menu, type **5** and press **Return** to terminate the installation. The following message appears:

```
Terminate Installation Utility? (Y/N) =N?_
```

- Step 9** Type **Y** and press **Return**. The following messages appear:

```
Remove Installation Diskette NOW!
Suspending Installation Process...
Rebooting.....
Reset System NOW!
```

- Step 10** Reboot the system:

- Remove the diskette from the drive and press the A-side **RESET** button on the AAC to allow the system to boot from the hard disk.
- If the system is redundant, also press the B-side **RESET** button on the AAC to allow that side to boot from hard disk.

- Step 11** Log on to the system. Refer to the *Cisco VCO/4K System Administrator's Guide* for instructions.

The installation procedure is now complete. You can now perform additional database entry for routing tables and impulse rules specific to TeleRouter operation. Refer to the “Database Administration” section on page 1-10 for more information. You can use the Enable/Disable Option selection to deactivate and reactivate the optional software. Refer to the “System Configuration” section on page 1-10 for more information.



Note

TeleRouter must be configured in the system data base using the Host Configuration utility for the overlay to perform call routing. Refer to Chapter 4, “System Configuration,” for more information.

If you encounter any difficulties during the installation process or need more information, contact your Cisco Systems TAC.

Performing a Database Backup

To perform a database backup using the Installation Disk Utilities, complete the following steps:

-
- Step 1** Access the Installation Utilities screen.
- Step 2** Insert a formatted high-density diskette into the floppy drive.
- Step 3** Type **2** and press **Return**. The Disk Utilities screen is displayed (see Figure 1-3).

Figure 1-3 Disk Utilities Screen

- Step 4** Type **2** and press **Return**. The following message appears:
Enter file to be copied:
- Step 5** Type **C:/DBASE/*.tbl** and press **Return**. The following message appears:
Enter target file:
- Step 6** Type **A:** and press **Return**. The following message appears:
Copying files...
When all files have been copied, the Install Disk Utilities screen is displayed.
- Step 7** Type **7** and press **Return** to return to the Installation Utilities screen.
- Step 8** Remove the backup diskette and continue with the installation process.

TeleRouter System Administration

TeleRouter preserves the system administration functions and basic organization of system software. The following TeleRouter-specific screens can only be accessed when the overlay is loaded on the system:

- Routing Table Summary
- Routing Table Configuration (accessed from Routing Table Summary)
- Display Routing Statistics

Several standard administration screens provide additional control over TeleRouter processing. All TeleRouter-related screens are summarized in the following sections.

Database Administration

The Routing Table Summary and Routing Table Configuration screens are used to create routing instructions based on digit matching. An additional impulse rule token, ROUTE [Tx], is provided for call processing. This token initiates call routing based on the information configured in the Routing Table displays. The ROUTE [Tx] token is accessed from the Impulse Rules Table display. Refer to Chapter 3, “Database Administration,” for more information on TeleRouter Database Administration screens.

System Configuration

The Host Configuration screen is used to enable/disable the TeleRouter software overlay and permits the overlay to function in an unhosted (stand alone) environment. A trace option on this screen interacts with the System Trace Configuration utility to trace TeleRouter control messages. A system feature on the System Features display an unhosted (stand alone) environment. Refer to Chapter 4, “System Configuration,” for more information on the System Feature Configuration screen. Stand alone TeleRouter operation is discussed in Chapter 2, “Hosted and Stand Alone TeleRouter Operation.”

Maintenance

The Alarm Condition screen contains two TeleRouter-specific alarms relating to resource limitation conditions. Refer to Chapter 5, “Maintenance,” for more information.

Diagnostics

From the Diagnostics screen, the Routing Statistics Display screen provides detailed status information on call routing activity. This display can be used to trace routing activity and offers useful debugging information. Refer to Chapter 6, “Diagnostics,” for more information.

Disabling TeleRouter Operation

The Enable/Disable TeleRouter Option selection on the Installation Utilities screen can be used to activate and deactivate the TeleRouter overlay. You must boot the system from the TeleRouter floppy diskette and choose option **2** on the Installation Utilities screen. If TeleRouter is currently operating on the system, this action disables the overlay; otherwise, choosing this option activates TeleRouter.



Note

The Enable/Disable TeleRouter option allows users to deactivate TeleRouter without modifying their database. For example, ROUTE [Tx] tokens can remain in impulse rules (these tokens are not executed). The TeleRouter overlay can also remain defined on the Host Configuration screen.

Disabling TeleRouter operation has the following effects on system processing:

- All ROUTE tokens are ignored during impulse rule processing (the system skips over the ROUTE token and executes the next token).
- No Routing Action (\$D5) reports are generated and sent to the host.

- The Routing Table Summary, Routing Table Configuration, and Routing Statistics Display system administration screens cannot be accessed.

